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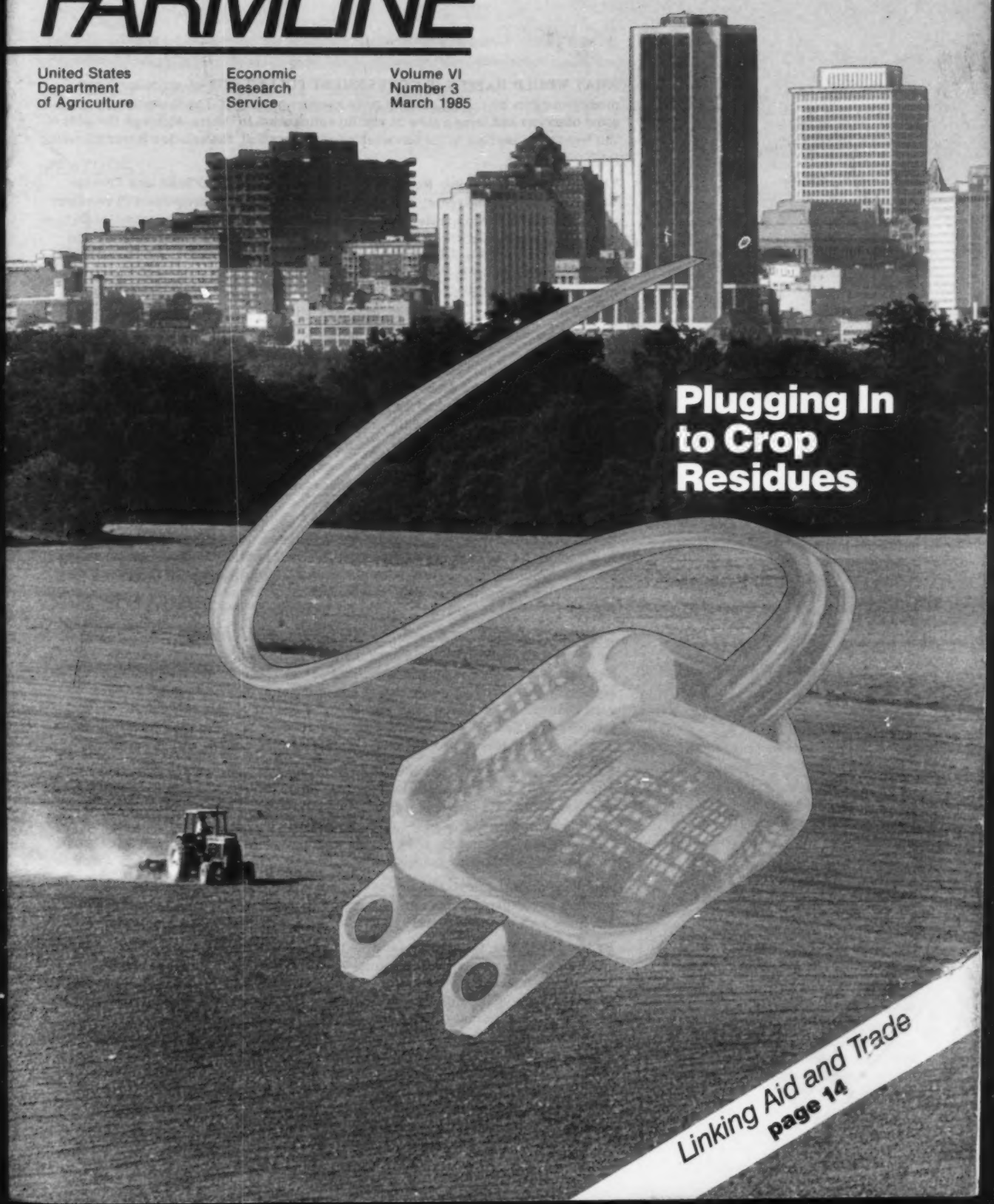

Plugging In to Crop Residues

Linking Aid and Trade
page 14

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PERSPECTIVES

WHAT WOULD HAPPEN IF GOVERNMENT PULLED OUT of agricultural commodity markets by ending all farm price support programs? The thought may scare some observers and bring a glow of wishful anticipation to others. Although the odds of this happening anytime in the foreseeable future are small, the question is worth looking into.

That's just what Economic Research Service analysts Patrick O'Brien and Thomas Fulton did. In a special report, they projected the economic consequences of two farm policy alternatives at opposite ends of the spectrum: complete elimination of farm price and income supports, or reversion to the large-scale government farm programs enacted in the 1930's and 1940's. Their projections under the "reversion" scenario are discussed on page 6 of this issue. Projections under the "no-support" scenario are summarized here. The new farm legislation expected this year will be somewhere between the two extremes.

Their report suggests that overall U.S. farm production might increase about 10% between 1985 and 1990 under the no-support scenario. Crops in storage would drop about 25%, and export volume would rise by roughly the same percentage. Land values would fall to reflect the decreased income-earning capacity of farm assets. Initially, farm prices for major crops would drop from projected 1985 levels. By 1990, however, prices for most crops could be even with—and in several cases above—the levels of 1985. In the face of weak prices, farmers would struggle to cut operating expenses while keeping output and receipts as high as possible.

Chronologically, much of the bad news comes first. "A decision to eliminate supports would be enormously disruptive in its early stages," says the report. Net cash farm income might fall as much as 30% in the first year, and many highly leveraged operators would be forced out of business. Possibly 30 million acres of less productive land could be abandoned, and the fertilizer, pesticide, and machinery industries would be shaken by the downturn in demand for farm production inputs. Demand for farm machinery, in particular, would drop sharply, further weakening the outlook for an industry already operating well below capacity.

Dairy farms and, to a lesser extent, cotton and feed grain producers would suffer the worst declines in economic well-being. Large, debt-ridden operations would face serious liquidation pressures as land values declined and net cash incomes fell. But most of the land on liquidated farms would change hands and remain in production. Impacts on rural communities would be most serious in the Great Plains and western Corn Belt, regions where hundreds of counties are heavily dependent on income from agriculture. The states hit hardest might include the Dakotas, Iowa, Kansas, and Nebraska.

Farms that earn most of their income from livestock, other than dairy, would be least affected. In fact, the livestock industry and crop sectors not currently protected by price supports could face reduced input costs. In addition, the transportation, processing, and marketing sectors of the economy would benefit from the increased flow of farm products for domestic and export use, bringing a net gain in employment in agriculture-related industries and a boost to GNP.

And once the difficult transition was made, the farm sector would emerge in a stronger position to compete internationally for export markets and to compete domestically for resources with other industries.

By the mid-1990's, the farm sector would have undergone significant adjustments, including a shift to a lower cost structure. Compared with the alternative premise of high price supports, there would be stronger demand for farm products, and farmland values would be more in line with the returns generated from farm production. Farmers would be forced to gear output to the market demand for their products. Federal farm program costs would be relatively low, limited to financing the disposal of reserve stocks accumulated before the start of the 1986 marketing year. Costs would be measured in the hundreds of millions of dollars rather than in the billions. Consumer food expenditures might be $20 billion a year lower than under large-scale government programs. The report also notes that significant variations in U.S. yields and exports could bring volatile year-to-year swings in farm and food prices.

FARMLINE

AGRICULTURE . . . NATURAL RESOURCES . . . RURAL DEVELOPMENT
Practical economic intelligence from USDA's Economic Research Service

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If energy prices swing upward, the Great Plains could be one of the regions to yield another bounty from agriculture. Analysts say crop residues and other wastes may one day substitute for some uses of coal and oil.

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What would happen if no new legislation were to be passed to replace, extend, or update the 1981 farm bill? The answer: reversion to so-called permanent legislation—farm laws enacted decades ago and still on the books.

Is Protein-Fortified Milk the Answer? *by Hilary Sheevers* 8

Californians drink richer tasting, protein-fortified milk, and they drink a lot of it. Some observers see a connection and suggest that California may have part of the answer to the nation's milk surpluses. Others are less certain, and economist Dick Fallert explains why.

The Allure of the Llama *by Ellen Banker* 12

There are now as many as 10,000 llamas right here in the USA, serving as pets or pack animals—or just breeding other llamas. Llama ranchers see this as the beginning of what might eventually be a large American llama industry.

Exports Are Weak, But Imports . . . They're Booming *by Eric Van Chantfort* 13

U.S. agricultural trade set a new high last year, but the record was on the import side. The economic recovery is spurring demand for imported products, and the strong dollar is keeping import prices down.

The Link Between Aid and Trade *by Eric Van Chantfort* 14

Foreign aid may be a tool for getting U.S. farm exports back on the growth track. U.S. sales depend on healthy, growing economies abroad, and many nations need development assistance. Economist Lon Cesal says that aid can be targeted to the mutual advantage of both giver and receiver.

Terminally Confused by Computer Modeling? *by Ellen Banker* 16

Agricultural economists are building increasingly sophisticated computer models designed to simulate the real world. Analysts and policymakers look to the models to help make forecasts and weigh policy options. If different models give different answers and no model can accurately predict the future, what good are they? Why are they being used?

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Plugging In to Crop Residues

Known largely as a producer of wheat and other crops, the Great Plains could be one of the regions to yield another bounty from agriculture if and when energy prices rise significantly.

Analysts are investigating the energy potential of various parts of the country, exploring how crop residues and other wastes may one day substitute for some uses of oil and coal.

"In times of high energy prices and scarce energy supplies, the world seeks alternative energy sources," says economist Walter Heid, formerly of USDA's Economic Research Service. "The conversion of crop residues into fuel might ease future energy shortage problems."

Heid focused on the 10-state Great Plains region that reaches from North Dakota and Montana down to New Mexico and Texas.

"The Great Plains is a substantial source of grain for the world," he says. "Most U.S. wheat grows on the Great Plains. Other major crops include corn, sorghum, barley, oats, soybeans, and cotton."

Looking to a time in the future when crop residues may be more competitive with conventional energy sources, Heid says that in the Great Plains "nearly 125 million tons of crop residues may stay in fields following harvest. Around 53 million tons could be removed without causing erosion."

Ready Sources of Energy

Already, such residues as corn stover, grain sorghum stover, and wheat straw are ready sources of fuel energy in the 10-state region. These residues and other wastes, such as manure, may be either burned directly or decomposed into methane gas.

"The most economical use of crop residues may be to complement the use of other waste products in generating electricity," Heid suggests. "Since they're seasonal, crop residues can be combined with livestock manure, agricultural processing wastes, and municipal solid wastes."

Economical conversion of crop residues into energy might ease future energy shortage problems.

Municipalities and some processing firms began using the direct burning process in the early 1980's, but coal has remained the major fuel.

At the moment, crop residues cannot be stored inexpensively. But should storage become feasible as a result of rising energy prices, residues could help to even out supplies of waste products. That would enable towns and cities to use their municipal waste conversion plants more fully while providing farmers with a market for another product.

In terms of cost, says Heid, "crop residues were competitive with coal in the early 1980's for short-distance hauls. Bulky residues and wastes are expensive to transport and can be shipped inexpensively no more than 50 miles to a conversion plant." Coal is denser and provides more heat energy than comparable amounts of residues.

Great Plains crop residues can be delivered 10 miles to off-farm conversion sites for about $29 per ton (1982 dollars) or $2.07 per million Btu, which compares favorably with coal costs. However, a 50-mile haul costs an additional $22 per ton. "Crop residues would be competitive with coal only if their delivered cost per ton stayed below that of coal after being adjusted for differences in Btu output."

Other concerns are the different kinds of conversion plants that must be built to accommodate crop residues rather than coal, and the fluctuating supply of residues that would be available because of the variations in yield and acreage of principal crops.

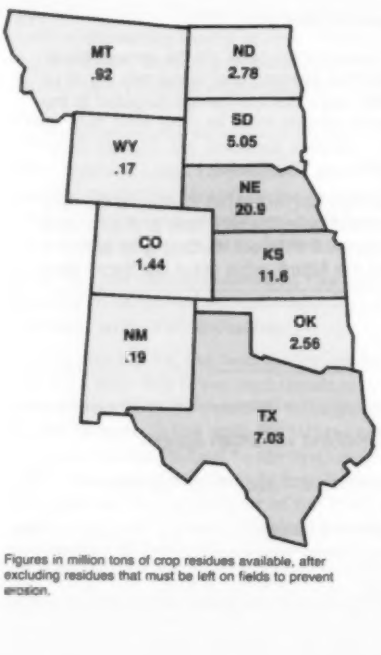
Another Consideration:

Heid adds that "parts of the Great Plains still suffer occasional desert-like conditions because of the flat terrain, low rainfall, and high wind. Farmers must manage their cropping and fallowing practices to allow for these conditions. Summer fallow over much of the western and northern Great Plains and stubble management throughout the center of the Great Plains, from Texas to North Dakota, limit the amount of crop residues that are available for removal. However, in areas where rainfall is more plentiful or irrigation is practiced, high tonnages of crop residues result."

Heid specifies the kinds and densities of residues that should be available in the next decade.

"Corn stover will account for a large percentage of the available residue in the

Nebraska, Kansas, and Texas Lead the Great Plains in Crop Residues Potentially Available for Generating Energy



Figures in million tons of crop residues available, after excluding residues that must be left on fields to prevent erosion.

Energy from Animal Wastes

Livestock and poultry wastes could generate about 80 trillion Btu of energy for farms in the South if conventional energy prices increase substantially from present levels.

That's enough energy to provide hot water for roughly 1.6 million homes.

"The potential is out there for using animal manure and litter to produce large amounts of energy, but the economic conditions have to be right," says Economic Research Service economist Harold Jones. Jones and University of Georgia researcher E. A. Ogden jointly studied this potential in 12 southern states.

According to Jones, a big jump in conventional energy prices must occur, or government must provide subsidies in order for farmers to adopt energy conversion systems for organic wastes. Current prices for conventional forms of energy appear to be stabilizing somewhat, but may be on the rise again by the end of the decade.

"By 1990, the South could provide nearly 29 percent of the total potential biomass-based energy recoverable from livestock and poultry wastes in the United States," Jones says. Biomass energy refers to organic matter directly burned or converted to methane gas to produce thermal or electrical energy.

"Most livestock and poultry manure in the South is now spread on land as a fertilizer supplement. Its value from this use in 1990 may total about $400 million, considerably less than its potential value as a biomass energy source."

A researcher adjusts the flow of methane gas to an engine-generator that converts the gas to electricity. The gas, produced from manure at the Millbrook Dairy Farm outside Ithaca, New York, provides most of the farm's electricity and much of the household water and space heating.
Photo courtesy of Cornell University.

The potential energy value from anaerobic digestion and direct burning could total around $644 million by 1990, using current energy prices, he says. The value would be higher if energy prices have risen by then.

Some of this energy could come from anaerobic digestion of manure produced from dairy herds of 30 or more cows, hog farms with sales of 500 or more head per year, grain-fed cattle on farms with sales of 1,000 or more head annually, and poultry farms with flocks of 20,000 hens or more. Anaerobic digestion involves the production of methane gas from bacterial decomposition of organic matter in an airless chamber.

Jones says "these farms could produce more than 20 billion cubic feet of methane gas in 1990, valued at $169 million if substituted for LP gas at current price levels of 77 cents per gallon. The value could be much higher if LP gas prices increase substantially by the end of the decade."

However, for poultry operations in which large quantities of litter are mixed with the waste, anaerobic digestion is not as suitable because the litter slows down the digestion process. "Direct combustion is probably the most feasible process for converting litter-based manure into energy," Jones says.

Thermal energy from direct burning of poultry litter wastes could be worth about $475 million in 1990 if this energy were used to replace LP gas at current price levels. Contributing to this source of energy would be broiler farms with sales of 60,000 or more birds annually, turkey farms with yearly sales of 30,000 or more birds, and pullet-growing farms with annual sales of 30,000 or more birds.

These farms are considered large enough to more easily adopt direct-burning technology.

"Four states alone account for almost two-thirds of the thermal energy potential of the South," Jones says. "They are Arkansas, Georgia, North Carolina, and Alabama." Other states included in the study are Florida, South Carolina, Louisiana, Mississippi, Kentucky, Tennessee, Virginia, and West Virginia.

Great Plains, especially in the northern states," he says. "Corn residues from irrigated areas, primarily in Nebraska, should constitute most of this tonnage."

Among the states in the region, Nebraska, Kansas, and Texas are projected to produce 75 percent of available crop residue.

"The remainder will be widely dispersed among the other seven states," says Heid. "Even within the three major states, not all crop residues can be collected cheaply. Unless sufficient quantities of residues exist within a radius of 10 to 15 miles from a central conversion plant, gathering residues and converting them to fuel will cost too much."

But if fuel prices escalate significantly, separating the wheat from the chaff—and using the chaff for energy—may be more important than ever. □

[Based on information provided by economist Walter Heid, Jr., formerly of the National Economics Division, Economic Research Service.]

If Time Runs Out on the Farm Bill

Reversion to permanent legislation. That's how officials at USDA refer to the process of reverting back to the old laws that would govern U.S. agriculture if no legislation is passed to replace, extend, or update the 1981 farm bill, which expires at the end of this year.

Specifically, the Agricultural Adjustment Act of 1933, the Agricultural Act of 1949, the Commodity Credit Corporation Charter Act of 1949, and the Agricultural Trade and Development Act of 1954 are still on the books, hence the designation "permanent." These laws serve as the basis for farm legislation and are sometimes referred to as "enabling legislation."

Through the years, they have been superseded by a series of temporary farm bills and other measures designed to address changing conditions, concerns, and farm program objectives. The 1981 farm bill was one of these measures, with a 4-year lifespan designated in the law.

While only one of several possible policy alternatives, reversion to the so-called permanent laws would take place automatically if Congress and the Administration failed to agree on new legislation or an extension of the 1981 farm bill. This would actually be a reversion to farm programs of the 1930's and 1940's when agriculture was quite a bit different than it is today. The original laws were formulated to address the specific problems of those eras, not current conditions, according to economist Patrick O'Brien, deputy associate administrator of USDA's Economic Research Service.

"The reversion scenario is just an outline of a hypothesized chain of events. But it's one that would hold some far-reaching consequences," he says.

For agriculture, the most significant impacts of reversion would be: higher price and income supports; no mandatory controls on acreage, production, or marketings; and the mandatory purchase of surplus production by the federal government.

There would be no set-aside programs, target prices, or payment limitations.

To some farmers, this might sound too good to be true. Production could be virtually unlimited for crops listed as basic commodities in the permanent legislation—corn, sorghum, barley, rye, oats, wheat, peanuts, cotton, rice, soybeans, wool and mohair, and tobacco.

Under reversion, all the current nonrecourse loan rates would increase significantly because they'd be set at a prescribed percentage of parity—usually from 50 to 90 percent—using the very favorable 1910-14 period as the benchmark.

There would be no set-aside programs, target prices, or payment limitations of $50,000 per producer. And the government would be required to buy all the surpluses of the basic commodities that farmers were unable to sell on the domestic or foreign markets at parity-linked price levels.

In fact, farmers could simply forget competition. World prices or world markets would not be a concern. "Barring crop disasters in the rest of the world, most U.S. crops would never make it to the world market," O'Brien says, "but would end up in federal government stockpiles."

How well or how long could the reversion work? "The truth is," O'Brien says, "that it could not work for any length of time." What looks like a rosy picture for farm income in the short term would spell disaster for U.S. agriculture and trouble for the rest of the economy in the long run, O'Brien maintains.

"By 1990, an additional $30 to $40 billion a year could be added to what taxpayers already pay for farm price support programs," he says.

In theory, most of these expenditures would be recovered as the commodities acquired by the government were resold. But, with price supports set well above market-clearing levels and sales by the government allowed only if market prices moved above support levels, the probability of any large-scale resale would be very limited.

Although the reversion would benefit some agricultural industries, it would certainly hurt others, according to analyst Thomas Fulton, also of the Economic Research Service. The strong demand for inputs would dramatically increase sales of farm machinery, fertilizer, herbicides, and pesticides.

But receipts in other industries, such as food transportation, processing, and marketing, would drop considerably

There would be other consequences, too. Consumers would foot much larger food bills—possibly $20 billion higher by 1990. Food stamps, charitable donations of commodities from federal stockpiles, and food donations and sales to developing countries would all be eliminated under "enabling legislation."

Deficit spending could take on a whole new meaning with dramatic increases in government farm expenditures, and this would naturally cause inflation to rise dramatically as well, O'Brien says.

An expanding money supply, combined with higher food prices, could add 1 to 2 percentage points per year to the inflation rate, O'Brien says. And if the government borrowed on the open market to finance the added deficit, O'Brien adds, an average 1 to 2 percentage points per year could be added to interest rates.

In short, real economic activity and employment for the economy as a whole would grow much more slowly under reversion, according to O'Brien.

"These factors are probably enough to encourage the passage of new legislation this year, with the reversion scenario hopefully only a remote possibility," he concludes. □

More Sting, Less Honey

The Africanized honey bee, sometimes mislabeled the killer bee, has successfully colonized much of South America during the last 30 years. It has now spread as far north as Costa Rica, and no known obstacle will prevent it from entering the warmer areas of the United States, according to this ERS report.

If the bee establishes itself in the American South and Southwest, and if it causes the same problems it has caused in South America, it could threaten the U.S. beekeeping industry.

The industry's revenues from honey, beeswax, package bee sales, and pollination are now around $180 million a year. The spread of the Africanized honey bee could cut these revenues by a projected $26-$58 million a year, depending on the areas colonized by the bee and on how the bee behaves when it reaches the United States.

Some of the problem traits of the Africanized bee include aggressive hive defense and stinging, excessive swarming, robbing honey from other bee colonies, and taking over European honey bee colonies. These and other undesirable traits result in lower honey production per hive. In addition, these bees present risks that discourage people from remaining in the beekeeping business.

The report notes that while the Africanized bee is not a major public health hazard in South America, there have been mass stinging incidents causing human and livestock deaths. Honey production has been dramatically reduced in some countries.

On the brighter side, there is also some evidence suggesting that the bee may be less aggressive in cooler areas.

This report assesses the potential economic effects of the Africanized bee on U.S. honey and beeswax production, queen and package bee production, migratory beekeeping, and almond pollination.

The Africanized Honey Bee in the United States: What Will Happen to the U.S. Beekeeping Industry? *by Robert McDowell. (Published November 1984; 33 pages of text, maps, data tables, and references; GPO Stock No. 001-019-00356-1; $2.25.)*

Urban Sprawl: Still a Threat?

Most U.S. farmland is in no danger of being overrun by urban sprawl, according to a recent report by two natural resource economists in USDA's Economic Research Service.

They point out that more than 80 percent of U.S. cropland and potential cropland is located in nonmetropolitan counties subject to little or no urban encroachment.

Only in the Northeast is most of the cropland close to urban areas and, therefore, under greater pressure.

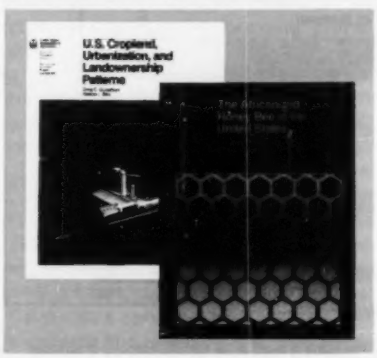
The report indicates that the large migration to nonmetro areas in the 1970's did not create a serious threat to farmland. More than 70 percent of the population growth in nonmetro America from 1970 to 1980 was confined to 216 counties that hold only 6 percent of the nation's cropland.

As a result, write the authors, "the rate of conversion of U.S. cropland to urban and transportation uses in the 1970's was modest—probably less than one-tenth of 1 percent per year."

However, they also caution that the figures on converted acreage do not necessarily measure the full impact of urbanization pressures. "Even the prospect of future conversion can undermine the long-term productivity of agricultural lands and cause premature idling of farmland."

The risks are greatest in counties near urban areas, where shifts in land use are more common than in nonmetro counties and different landownership patterns can be observed. In more urbanized counties, for example, a higher proportion of cropland is held by nonfamily corporations and by owners who aren't farm operators.

U.S. Cropland, Urbanization, and Landownership Patterns *by Greg Gustafson and Nelson Bills. (Published November 1984; 17 pages of text and data tables; GPO Stock No. 001-019-00366-9; $1.50.)*



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Is Protein-Fortified Milk the Answer?

Californians may not know it, but for years they've been drinking richer tasting lowfat milk that's higher in protein and calcium than most of the milk the nation drinks. And California dairy farmers have enjoyed a market where per capita consumption of milk is above the U.S. average.

These two facts have given birth to an idea that is attracting attention in many factions of the dairy industry.

Some industry specialists have reasoned that the California example may be a keystone for improving milk consumption nationwide. They believe that if milk tasted richer and contained more nutrients, consumers would buy more milk and swallow up part of the 9-billion-pound oversupply.

Not everyone agrees.

The issue centers around California's standards for milk solids-not-fat (SNF)—mostly protein, calcium, and lactose (milk sugar). California requires a minimum of 10 percent SNF in lowfat milk, 9 percent in skim milk, and 8.7 in whole milk. The federal standard is 8.25 percent SNF in all three types of milk.

It's not that California cows are particularly special. The higher standard is usually met by fortifying fluid milk with unsweetened condensed or nonfat dry milk (milk with the butterfat and water removed).

"California didn't allow processors to sell lowfat milk until 1962. When the California legislature finally approved lowfat milk sales, it required that extra SNF be added partly to make the milk taste thicker and richer," says dairy economist Richard Fallert of USDA's Economic Research Service.

Separating the Causes

"Unfortunately, improving national milk consumption may not be quite as easy as having the federal government simply adopt California's higher SNF standards," says Fallert. He contends that many factors exist in the California marketing area that cloud an obvious cause-and-effect relationship. "For example, California has one of the oldest and most innovative milk advertising campaigns in the nation, and that helps to increase milk consumption."

And there are other factors that may account for California's high consumption rates, according to Fallert. California has:

- relatively low retail milk prices because of efficient farms and markets.
- a younger population than the U.S. average—important because children tend to drink more milk than adults.
- especially high milk quality on the farm and throughout the distribution system, which makes milk less likely to pick up off-flavors in storage or transit.

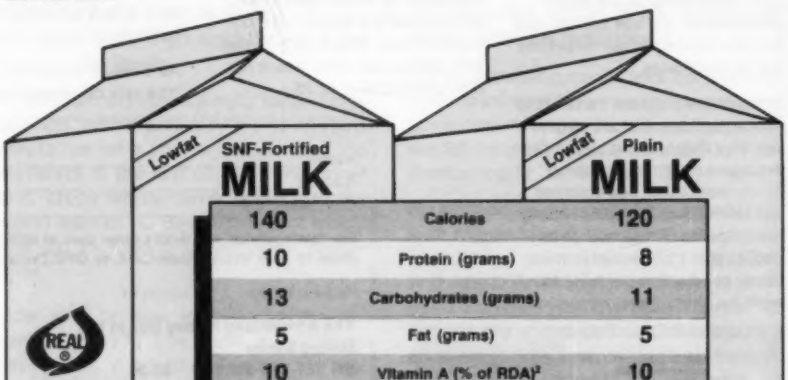
"The case for higher SNF standards is not clear-cut," Fallert says. "While per capita consumption of fluid milk in California is about 11 percent above the national average, it is not the highest in the nation. Moreover, California also produces an oversupply of milk. Thus, it does not seem likely that a shift to higher standards would solve the current U.S. supply-demand imbalance which has its roots in other causes," he elaborates.

Shift in Consumption Patterns

Fallert is not even convinced that higher SNF standards would necessarily provide an incentive to consumption in all regions of the country. Some evidence, in fact, points in the other direction.

"Perhaps one of the most important questions that needs to be looked into," he emphasizes, "is that there seems to be a change in consumer preference away from milk fortified with SNF—at least in some markets. In areas outside California where consumers had a choice between plain and SNF-fortified

Nutrients Are Somewhat Higher in SNF-Fortified Lowfat Milk Than in Plain Lowfat Milk[1]



SNF-Fortified		Plain
140	Calories	120
10	Protein (grams)	8
13	Carbohydrates (grams)	11
5	Fat (grams)	5
10	Vitamin A (% of RDA)[2]	10
6	Vitamin C (% of RDA)	4
8	Thiamine (% of RDA)	6
30	Riboflavin (% of RDA)	25
35	Calcium (% of RDA)	30
25	Vitamin D (% of RDA)	25

[1]Based on milk samples from the Washington, D.C. area.
[2]RDA is the recommended dietary allowance established by the Food and Nutrition Board of the National Academy of Sciences.

Pricing Milk by its Components

"It might be said that individual dairy farmers are not paid according to the true value of their milk's ingredients," notes economist Richard Fallert. Farmers are paid for the volume of milk they produce. They receive only a small premium for high butterfat content and are paid only indirectly for solids-not-fat.

Milk has three components: butterfat, solids-not-fat (SNF), and water. Water is the largest component, making up 87 percent of the average gallon of milk. "Many economists and dairy industry people believe that dairy farmers should be paid for their milk's butterfat and SNF content," Fallert adds, "not for the water."

That's the idea behind multiple-component pricing. "The economic rationale for multiple-component pricing is that farmers should be paid as directly as possible for the value of the various components in the milk they deliver," Fallert says.

Paul Christ, a vice president at Land O'Lakes in Minneapolis, Minn., supports the idea. "Some co-ops, including Land O'Lakes, already pay a premium for high-SNF milk. But we don't pay enough [for dairy farmers to breed for increased SNF production], so farmers are still better off to breed and feed their cows for high-volume yield," says Christ.

Land O'Lakes and other co-ops particularly desire high-SNF milk for their cheese and butter production. Higher milk protein (a key ingredient in SNF) gives more cheese from less milk. In butter production, nonfat dry milk is a valuable byproduct used in food manufacturing, such as baking.

USDA's Fallert, however, foresees a possible problem if multiple-component pricing is used in the manufactured dairy products industry and not in the beverage milk industry. The practice could attract high-SNF milk to manufacturing plants, such as cheese producers, leaving fluid milk plants with the residual low-SNF milk.

Christ of Land O'Lakes says that farmers who improve their herd's SNF production are merely preparing for the future. "The dairy farm of tomorrow will remove the water from the milk right at the farm. The farmer will be paid just for the butterfat and SNF he produces. Thus, a herd with above average SNF production today will have a jump on the future."

milk, consumer purchases of fortified milk began to drop in 1973. At that time, fortified lowfat and skim milk represented 15 percent of total fluid milk sales in federal order markets. By 1983, SNF-added lowfat and skim milk sales had dropped to 6.6 percent of the total," says Fallert.

"Consumers may be choosing the lowest priced milk, and milk without added SNF is generally less expensive than SNF-fortified milk. Or perhaps the change represents a growing preference for the flavor of unfortified milk, or a lack of knowledge about the extra nutrients SNF-fortified milk offers. We can't be sure without further research," he says.

The questions do not end there.

Consumer groups argue that although SNF-fortified milk may taste richer, higher SNF standards would force retail milk prices to rise. Fallert agrees that California's special case of higher SNF standards and relatively low retail prices may not necessarily apply in other areas. He predicts that milk prices could go up by as much as 3 percent nationally, or 3.5 cents a half-gallon, because of the extra cost of adding SNF to milk to reach the California levels.

On the Plus Side

Fallert does see some advantages in the California example.

One potential advantage stems from the fact that current federal SNF standards are not regularly enforced, which sometimes leads to abuses in which milk has less than the federally required 8.25 percent. Enforcement of higher standards would not only avoid some of these abuses, it might offer taxpayers cost savings in terms of reduced milk price support expenditures by the Commodity Credit Corporation (CCC).

The CCC buys milk products—cheese, butter, and nonfat dry milk—when the market price falls below a preestablished support price level.

Because processors usually use nonfat dry milk to fortify fluid milk that falls below the required SNF percentage, higher SNF fluid milk standards would increase processor demand—and the price—for nonfat dry milk. The CCC would then have to purchase less dry milk, which Fallert believes could add up to a substantial savings—anywhere from $12-$218 million. The risk, of course, is that consumers might buy less milk because of the price increase.

Another benefit of higher standards, Fallert points out, is that they generally raise milk's nutrient content—especially protein, calcium, and vitamins. However, increased SNF also raises the calories.

But perhaps the most important unanswered question for dairy farmers is: Will higher SNF standards raise milk prices at the farm? "Well," says Fallert, "not necessarily. In most cases, our current pricing system doesn't directly compensate farmers for producing milk with higher SNF content, so their best bet is simply to produce for high-volume yields." □

Egg Industry Moves Northward

After three decades of growth in the Sun Belt, the U.S. egg industry seems to be packing up some of its cartons and moving northward.

Popular locations for large, new egg operations are near population centers in the Grain Belt, Middle-Atlantic states, and even in sparser western areas where eggs previously had to be shipped in.

The shift reflects higher transportation costs, both for bringing grain to southern hens and for getting their eggs to distant markets, according to agricultural economist Harold Jones, Jr., of USDA's Economic Research Service. Jones, a poultry analyst stationed at the University of Georgia, Athens, developed these conclusions with research assistant E.A. Ogden.

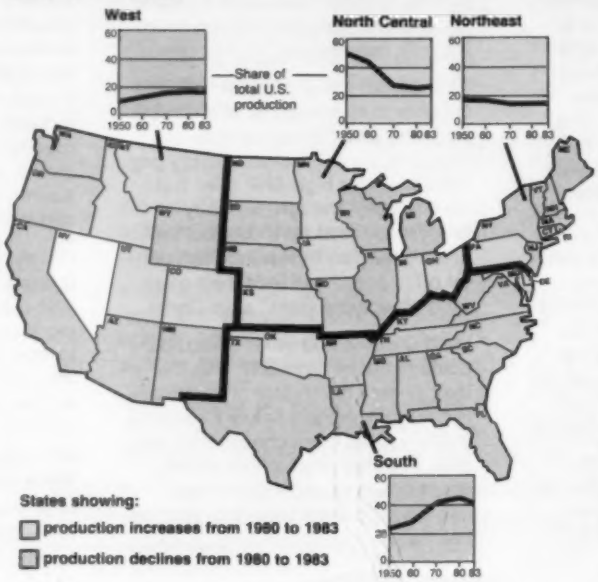
Jones and Ogden report that all the states along the nation's southern tier—from North Carolina to California—registered declines in egg production between 1980 and 1983. In contrast, nearly half the states north of Tennessee—from Maryland in the East to Idaho in the West—showed gains.

To be sure, the southern tier still claimed seven of the top 10 egg-producing states in 1983. Number one California was far out in front of second-place Pennsylvania. Georgia led fourth-place Indiana. Arkansas, North Carolina, and Texas were ahead of Ohio, while Florida and Alabama followed closely behind, completing the top 10.

Top 10 States in 1983 Egg Production

	Egg output, in millions	% change, 1980-1983
Calif.	8,173	-7%
Penn.	4,716	+11%
Georgia	4,671	-17%
Indiana	4,619	+25%
Arkansas	3,768	-9%
N. Car.	3,149	-0.8%
Texas	3,089	-0.1%
Ohio	2,980	+28%
Florida	2,959	-2%
Alabama	2,813	-16%

Recent Growth in Egg Production Was Concentrated Outside the South



However, Pennsylvania, Indiana, and Ohio all moved up in the rankings, while the others slipped or, at best, held onto their places. (Pennsylvania lost ground in 1984 because of the avian flu.)

"Substantial production gains occurred in the South in the late 1950's, early 1960's, and throughout the 1970's. But output in this region apparently peaked in 1980 and has begun to drop. On the other hand, production in the north central region is increasing," Jones says.

This doesn't mean that large numbers of egg producers are abandoning the South. Modern egg production complexes are so huge that the opening or closing of just one or two facilities can dramatically alter a state's total.

What Jones does see is further decentralization in a competitive market, where proximity to feed supplies and consumers can offer a significant cost advantage. "Higher transportation costs for grain and eggs in recent years have provided a greater incentive to self-sufficiency in some areas that were not formerly cost competitive in egg production," he notes.

"Modern egg operations are highly mechanized, requiring very large capital investments. Some of the newer operations have been financed by foreign investors. Once investors begin to expand in an area, momentum is often generated for additional investment."

The new investment—and the decentralization it is supporting—will probably affect retail price trends. "The shifts in production," Jones says, "may lead to lower costs for consumers if the new production complexes are as efficient as those in established areas."

Paying More, But Eating Cheaper

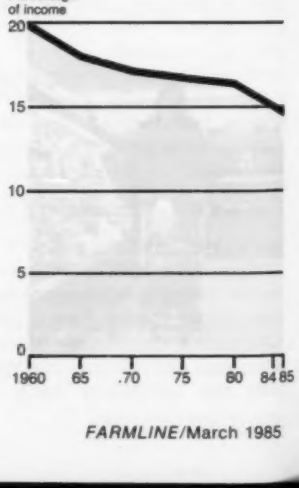
If you're an average consumer, you'll probably spend more money at the supermarket in 1985 than you did last year, but you may spend a smaller percentage of your income on food than ever before.

This news comes from economists of USDA's Economic Research Service who calculate such estimates based on projected food price increases, food consumption rates and expenditures, and anticipated changes in population and income.

According to ERS economist Ralph Parlett, the trends for 1985 are shaping up like this:

- Food consumption should be

The Percentage of Disposable Personal Income Spent for Food Keeps Dropping



up about 1.1 percent above last year's level.

• Food prices are expected to increase moderately this year—somewhere between 2 and 5 percent. Last year, food prices rose 3.8 percent; back in 1979, food prices jumped 10.9 percent.

• Total food spending by Americans should be up anywhere from 4 to 6 percent, reflecting the combination of higher consumption and higher prices.

However, after-tax personal income is expected to increase about 8 percent. And this translates into a food bill that takes a smaller bite out of income, leaving more to spend on other goods and services.

The 1985 figure—now estimated at 14.6 percent of income—is the lowest ever, down from 15 percent in 1984. "Back in 1960," Parlett says, "a consumer spent an average 20 percent of his or her take-home pay on food."

He is quick to add that these figures are all averages. Those with high incomes generally spend a smaller proportion of income on food, while food takes a larger cut of income from poorer people.

Gleanings

Consumers spent an estimated $332 billion on domestically produced farm foods in 1984, up from $315 billion in 1983 and $155 billion back in 1974. (Figures exclude fish, alcoholic beverages, and imported foods.) Increased spending reflected price increases related to rising costs—particularly after food left the farm—as well as a larger volume of food purchases stemming mostly from population growth. "Farm price increases have been fairly small, accounting for only a minor part of the gain in total consumer expenditures," says ERS economist Dave Harvey.

...**In fact, 83% of the rise** in food spending between 1974 and 1984 went to the food marketing sector for processing, packaging, transporting, and distributing farm foods. According to Harvey, only 17% went to cover the "farm value" of items purchased. Comparisons between 1974 and 1984 reveal some interesting changes, he adds. For instance: Consumers spent 29% of their 1974 farm food dollars in restaurants, fast food outlets, and other away-from-home eating places. In 1984, 36% of spending was for food prepared outside the home. Another change: In 1974, 36% of spending went to cover the estimated farm value of foods purchased. By 1984, only 26% of the consumer food bill covered farm value—the rest went to pay marketing costs.

...**the declining farm-value share** of food spending can be traced to greater rises in marketing costs relative to farm prices; more eating outside the home, where costs for preparing and serving food inflate the marketing share; and the consumer shift to more processed foods, where farm value represents a smaller percentage of the total price. Labor costs are the largest single component of marketing costs, taking about 44 cents of every 1984 dollar going to the food marketing sector.

The trade sector remains depressed, says ERS economist Paul Prentice. "Although many parts of the U.S. economy are experiencing the strongest growth in over 30 years, the recovery seems to be bypassing most export-oriented or import-competing industries." It's not just the strong dollar, he claims. "The world economy is still lagging behind the U.S. recovery, so foreign demand remains weak. Only Japan, Canada, and a few Far Eastern nations are enjoying an American-style boom. Western Europe, Eastern Europe, and many less developed countries have a sluggish recovery, at best, while the economies of the major debtors in Latin America continue to decline."

...**our record trade deficits** partly reflect these disparities in economic growth, Prentice says. One positive note, however, is that robust U.S. import demand is improving export sales of other nations, so that the U.S. is, in effect, exporting its recovery abroad. Also, the growing U.S. economy and strong dollar are attracting about $100 billion of foreign capital into the United States, helping to pay for part of the federal budget deficit.

World grain markets remain unstable...It's still a case of boom or bust conditions for U.S. farmers when it comes to exporting grain to volatile overseas markets, says ERS economist Thomas Miller. He describes the United States as "the main shock absorber in global grain markets. Unfortunately, U.S. stockholding in the 1970's often was not sufficient to bring any substantial stability to world markets."

...**and the outlook is not encouraging.** Miller says grain markets may become even more volatile. "The structure of world grain trade is becoming increasingly dominated by state trading organizations, bilateral agreements, and other trade restrictions that limit supply and demand adjustments in much of the world," he says. As more countries insulate their domestic markets from world prices, the growing burden of adjusting to fluctuations in supply and demand is forced onto the remainder of the world, including the relatively wide open U.S. domestic market.

The Allure of the Llama

Llamas are intelligent and can easily be trained as pets, pack animals, and sheep guardians. *Photo courtesy of Andy Tillman who raises llamas on his Athena, Oregon ranch.*

Rock star Michael Jackson is reported to have at least one. Kim Novak, the actress, and her veterinarian husband are said to own 23. In all, about 1,000 Americans raise llamas—the somewhat exotic South American native—as pets or as livestock, according to USDA economist Naaman Seigle of the Economic Research Service.

Llamas are now used mainly as breeding stock by ranchers, who generally sell the offspring to other breeders, or as pets and pack animals. Some breeders hope that this is the beginning of what will eventually be a very large American llama industry.

Although the meat is said to have a taste similar to beef, consumers aren't likely to see "llama burgers" anytime soon, if ever. The limited number of animals in this country and high prices make it economically impractical to use llamas as a commercial source of meat, Seigle says.

"There are somewhere between 7,000 and 10,000 llamas in the United States right now," he adds, "and at least 90 percent of them are used for breeding. These figures are about double the numbers of just 5 years ago." Many are direct descendants of llamas that were brought to California from Chile by publisher William Randolph Hearst in 1929.

Millions of llamas are found in Peru, Bolivia, and Cnile, where they are used as meat animals, beasts of burden, and a source of wool. The reason more have not been imported into the United States is the fear of hoof-and-mouth disease, which is common in other South American livestock. U.S. ports were closed to llamas in 1930.

In 1983, the ban was lifted briefly, and 299 llamas and alpacas were admitted. The ban was then reinstated when the disease was detected in Chile by the World Health Organization. The ban was again lifted in 1984, and an additional 350 llamas and alpacas were imported.

Limited U.S. llama numbers make the animals that are already here something of a novelty, and demand couldn't be better, Seigle says. The current price for top breeding stock ranges up to $10,000 for a young female, according to Andy Tillman, a llama breeder in Athena, Oregon, who is also a founder and past president of the International Llama Association. The association acts as the educational arm of the industry. "As breeders, we promote llamas as pets, pack animals, and companions," Tillman says.

Llamas do have some limitations as pets. Mostly, it's size. "Although the animal is intelligent, easily trained, and can be quite affectionate," Tillman says, "it's just too big to be a lap dog." The cuddly 30-pound baby llama can grow into a 6-foot tall, 350-pound adult.

A llama also makes a good pack animal and can carry 80 to 100 pounds as far as 10 or 20 miles a day, according to Tillman. That's not as much, or as far, as a horse, but the llama is easier to care for. Raised in the proper setting, llamas don't need much food or water, and their soft hooves don't tear up the range the way a horse or mule would.

Last summer, in a test project in California, USDA's Forest Service replaced 12 pack mules with llamas and had considerable success. There are several enterprises in the West, and even a few in the East, where hikers can hire a guide, a cook, and a string of llamas to carry the gear.

In addition, llamas can be trained to protect other livestock, especially sheep, Tillman says. "There are several western sheep producers who use llamas out on the range as livestock guardians," he adds.

Then, there's the wool. "Hand spinners and weavers love it," Tillman says. Most producers sell it directly to craftspeople. "A single animal usually produces 2 to 5 pounds a year," Tillman says, "although some grow much more." Llama wool can sell for as much as $2 an ounce, compared with the average 65 cents a pound producers receive for sheep's wool.

And, of course, you can use llamas to produce more llamas. Oregon-based rancher Dick Patterson describes his 500-plus llama business as "a hobby that just got out of hand." He raises the animals, along with Arabian horses, on the range of his 555-acre ranch near Sisters, Oregon. Mostly, Patterson sells young llamas to zoos, other ranchers and farmers, and craftspeople, "but only in pairs," he says, "because one llama can really get lonely." □

[Based largely on information provided by agricultural economist Naaman Seigle of the National Economics Division, Economic Research Service.]

Exports Are Weak, But Imports . . . They're Booming

America set a record last year in agricultural trade, but the record was on the import side.

Economist Charles Goode of the Economic Research Service reports that U.S. imports of farm products were valued at $18.9 billion in fiscal 1984. That's up $2.5 billion from 1983's total and about $1.6 billion above our previous import record set in fiscal 1980.

The accelerated inflow of imports, however, is not limited to farm products. U.S. imports of nonagricultural goods jumped to $295 billion, up from $229 billion in 1983. The United States, says Goode, is accounting for a major share of world growth in imports as the economic recovery has increased the incomes of Americans and stimulated consumer demand for domestic and imported products.

Another key factor, of course, is the international role of the U.S. dollar. The high foreign exchange value of the dollar has raised prices for American goods on world markets and lowered prices for foreign goods on the American market. That has hurt U.S. exports and boosted U.S. imports, says Goode.

The dollar increased in value during 10 of the 12 months of fiscal 1984, reaching

Americans spent a record $18.9 billion on coffee and other imported farm products last year.

Continued strength in the value of the dollar will mean continued penetration of domestic U.S. markets.

an 11-year high against the German mark and setting all-time highs against the British pound and the French franc. Many analysts warn that continued strength in the value of the dollar will mean continued penetration of domestic U.S. markets by imported products—nonagricultural and agricultural.

In addition to the U.S. recovery and value of the dollar, Goode cites other reasons for the fiscal 1984 increase in our agricultural import bill. Freezes last winter in Florida and Texas led to increased imports of fruits and orange juice. Also, several popular imports carried higher price tags, which boosted overall spending by Americans on coffee, rubber, fruit juices, vegetable oils, and cocoa products.

Major farm products on the U.S. import list in fiscal 1984 included:

- Coffee imports worth about $3.3 billion, 18 percent above 1983's total. Brazil was our top supplier.
- Vegetables and preparations, with an import value of $1.3 billion, up 25 percent. Mexico was the major source.
- Fruits and preparations, which rang up a bill of $1.3 billion, an increase of nearly 33 percent. Concentrated orange juice was the most popular sales item for our number one supplier, Brazil.
- Beef imports, which dropped 16 percent to $1.2 billion. About 42 of every 100 pounds of imported beef came from Australia.
- Cocoa and cocoa products valued at $1.1 billion, up 28 percent. Brazil was the leading seller, followed by the Ivory Coast.
- Sugar, with an import value of $1.1 billion, up $171 million. The Dominican Republic was our biggest source.
- Wine imports valued at $932 million, up 9 percent. Italy, by far, was our leading foreign wine merchant.
- Rubber imports, which reached $854 million, a 47-percent increase from fiscal 1983. Indonesia supplied 60 percent of imported U.S. rubber, followed by Malaysia at 24 percent.
- Oilseeds and products, valued at $796 million, a jump of 52 percent. Coconut oil accounted for more than 42 percent of imported vegetable oil, and most of that came from the Philippines.
- Pork, with an import value of $703 million, up 10 percent. Canada, our number one supplier, set a record for shipments to the United States.
- Banana imports worth $666 million, up 14 percent. Costa Rica replaced Honduras as America's top banana supplier.

Around 60 percent of U.S. farm product imports in 1984 came from the developing countries, led by Brazil, Mexico, Indonesia, Colombia, and the Philippines. □

[Based on information from economist Charles Goode of the International Economics Division, Economic Research Service.]

Brazil, Canada, and Mexico Were the Three Major Suppliers of Farm Products to the U.S. Market in 1984

	Value of U.S. imports in millions	Percent change from 1983
Brazil	$1,936	+14%
Canada	$1,733	+15%
Mexico	$1,333	+9%
Indonesia	$791	+52%
Australia	$733	-8%
Colombia	$710	+27%
Philippines	$607	+24%
France	$606	+21%
Netherlands	$591	+20%
New Zealand	$533	-12%
Italy	$532	+8%
West Germany	$528	+21%

Figures for fiscal 1984 (Oct. 1, 1983 through Sept. 30, 1984).

The Link Between Aid and Trade

As lawmakers consider a variety of proposals for getting U.S. exports—both agricultural and nonagricultural—back on the growth track, one tool should not be overlooked, according to many analysts.

That tool is foreign aid, especially economic and agricultural development assistance.

"Aid policy can be an important complement to trade policy," says USDA economist Lon Cesal of the Economic Research Service. "Longer term gains in U.S. exports depend on healthy, growing economies abroad."

Cesal contends that competitive pricing, a reduction in trade barriers, and other promising U.S. export strategies may not be enough to spark a new surge in sales to debt-strapped, economically depressed Third World nations.

He points out that many developing countries now face a serious dilemma of how to pay their debt bills and still afford imported agricultural, consumer, and investment goods. Their economies are not generating the income growth necessary to stimulate strong internal demand, and their export sectors are suffering as their markets in industrialized countries have weakened.

As a group, the less developed nations are registering economic growth rates that may average a meager 2.8 percent a year for the 1980-85 period, according to one estimate. That's down from an annual growth rate of 5.2 percent during the 1973-79 period and 6.3 percent from 1960 to 1973.

"The high rates of economic growth enjoyed by the developing countries over the last few decades benefited U.S. farmers," Cesal says. During the 1970's, the developing countries made up the fastest growing market for U.S. agricultural products.

"By the same token, the current low rates of economic growth are hurting our farmers," he adds. From fiscal 1976 to 1980, U.S. agricultural exports to developing nations nearly doubled,

Aid should yield benefits for both the giver and receiver.

from $6.9 billion to $13.7 billion. In the following 4 years, ending in fiscal 1984, the increase in U.S. sales to the same group of customers amounted to only $1.2 billion.

Wanted: Economic Growth

What these nations need, Cesal says, is an acceleration in economic growth. That includes growth in their export sectors so they can earn the foreign exchange necessary to service their debt and still look to world markets for more than just subsistence food needs or, in some cases, food aid.

He points to the circular logic that often defines the relationship between development and trade.

"Economic and agricultural stagnation can force withdrawal from the world market, which, in turn, is the source of much of the capital, machinery, and equipment necessary for development. On the other hand, broadly based development generates higher incomes and increased demand for more agricultural products, consumer goods, and capital items available only through trade."

He cites an Economic Research Service study covering the 1979-81 period. It indicated that a 10-percent increase in the per capita income of the less developed countries led to a 13.6-percent increase in U.S. exports to those countries.

Surprising as it may seem, he says, successful development from the U.S. perspective must include an enhanced export capacity in other nations, even if it means the risk of competition.

"I think it's generally understood that for nations to import, they also need to export to earn foreign exchange, whether dollars or another currency used in international trade," says Cesal. "What we sometimes fail to realize is that many nations need help in developing export sectors of their economy, and that it's in our own interest to assist them if we want them as customers."

Mutual Benefits

In Cesal's view, this linkage of interests should be given greater emphasis if foreign assistance programs are to get the attention they deserve.

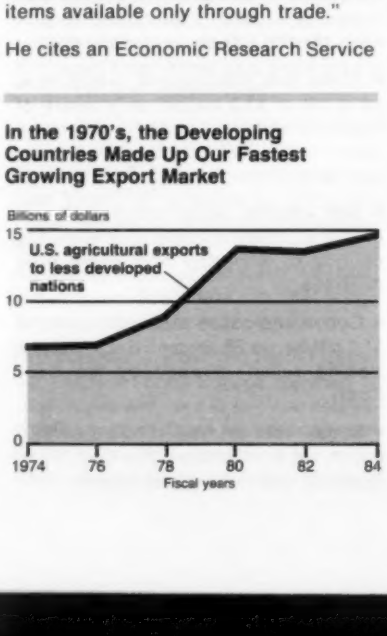
"Although the American people have been very generous, foreign aid programs often suffer when they are viewed as costly giveaways that offer little or nothing in return. The notion that aid is exclusively a one-way street hasn't been true in the past, and it need not be true in the future. Economic and agricultural assistance can and should yield benefits to both the giver and the receiver."

He identifies two main reasons why the connection between aid and trade is difficult to make.

One is that changing policies or events in other nations can significantly influence whether development efforts are productive. A revolution in a recipient nation, he says, can set back years of effort and convince some people that aid is a waste of money.

The second reason is that the payoff is often very long term, measured in years or decades. He cites U.S. assistance efforts in South America during World

In the 1970's, the Developing Countries Made Up Our Fastest Growing Export Market



Economic and agricultural development abroad boosts overall trade.

Photo of the Philippines courtesy of FAO.

War II, and British efforts in India and parts of the Mideast and Far East.

"These efforts of the 1940's and 1950's paid off in terms of rapid economic growth and expanded trade in the 1960's and 1970's," he says. "Meanwhile, other areas, such as Africa, continue to show the consequences of past neglect."

Some of our major commercial customers, including Taiwan, South Korea, Mexico, India, Brazil, Chile, Egypt, even Japan and Western Europe, were—and, in some cases, still are—recipients of U.S. assistance, including food aid.

Risks are always present, Cesal admits. The project may be abandoned, the country may turn to another supplier, or it may even become a competitor in certain sectors with the United States. Yet the risks are worth taking, he insists.

"Economic development abroad generates overall trade, which benefits the U.S. economy overall. But it may not always be in the best interest of all industry groups in our economy."

Improving Aid Programs

Bilateral U.S. development assistance to 80 or more countries is provided through the Agency for International Development and other public and private institutions. Multilateral U.S. assistance is channeled through the World Bank, the United Nations, and other international institutions. The United States supports programs in agriculture, education, health, transportation, communication, and industrial development—everything from shared research to the construction of ports to helping a country build a brand new industry.

Cesal supports these efforts, but he is convinced that the United States can better target its aid efforts to help developing countries in ways that will make them larger customers for U.S. products. One of his research objectives is to be able to identify and quantify the potential return to the U.S. economy from development projects.

"Economic analysis," he says, "might indicate that X amount of dollars invested in a certain development project in a certain country would eventually yield Y dollars in terms of increased commercial trade with that country. Although such figures might, at best, be rough projections, they would give policymakers and managers of aid programs some guidance in where and how to target our aid efforts."

In particular, Cesal suggests, we need to make an effort to identify and channel assistance efforts to areas of "complementary comparative advantage" where the results are mutually beneficial.

He explains this by offering the example of one South American country in which he has worked. The country, he says, wanted to develop a deciduous fruit tree industry and was especially interested in apples.

"From an economic standpoint, that was absurd because the soil and climate were not suited to growing apples on a large-scale commercial basis. On the other hand, its resources were well suited to the production of coffee. Our advice was simple: 'You import our apples, and we'll import your coffee.' "

In this case, the country did not have a comparative advantage in producing apples, yet it had a comparative advantage and a ready U.S. market for coffee. With the foreign exchange it could earn on its coffee, he explains, it could supply U.S. apples to its consumers at a lower cost than it could produce apples on its own.

"Through our foreign assistance, we can encourage nations to develop export sectors in which they have a comparative economic advantage, particularly sectors that won't compete with American products," Cesal says. "Then they will be able to export more and use the money to import U.S. agricultural products as well as investment goods needed to develop their economies."

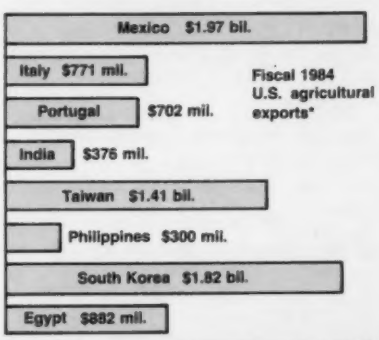
This strategy, obviously, does not apply in situations of immediate need. Cesal contends that food aid and other special assistance projects are often justified strictly on a humanitarian basis.

In his view, however, many decisions on longer term development assistance can be based on complementary comparative advantage.

"Common sense suggests that a country that pursues a development strategy consistent with its comparative advantages will have a higher rate of economic growth than if it pursues a strategy inconsistent with its unique mix of land, labor, and capital. Where the comparative advantages of both nations complement each other, that probably means a buyer for the developing country's products and a growth market for U.S. products." □

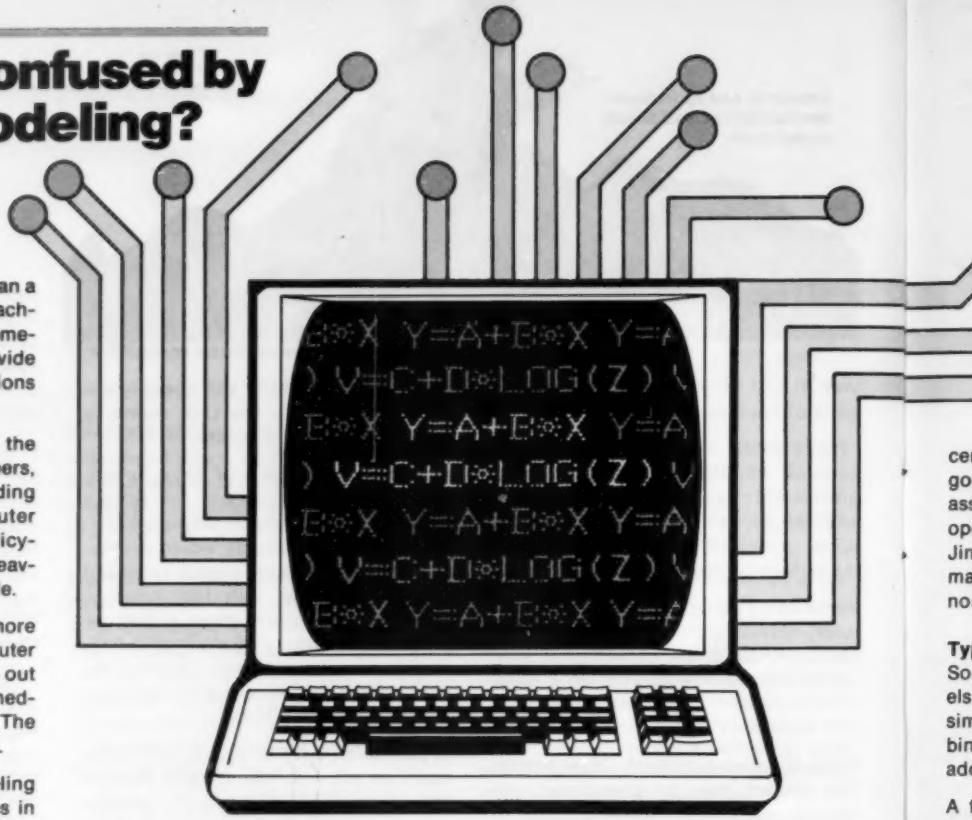
[Based on information provided by economist Lon Cesal, who heads the agricultural development branch in the International Economics Divison, Economic Research Service.]

Some Past and Present Aid Receivers Are Now Major Markets for U.S. Agricultural Products



*Figures include some U.S. government financed sales in the case of Egypt, India, the Philippines, and Mexico.

Terminally Confused by Computer Modeling?



Is a computer model little more than a crystal ball with numbers attached? Or is it something different, something better, a tool that can provide reliable answers to important questions in agriculture?

The verdict is not unanimous, but the trend is clear. In ever greater numbers, agricultural economists are building increasingly sophisticated computer models. Both farm analysts and policymakers are relying more and more heavily on the results the models provide.

These models are typically far more complex than the personal computer models farmers are using to figure out optimum feed ratios, irrigation schedules, and cropping alternatives. The appeal, however, is much the same.

Those devoted to computer modeling point out that the relevant variables in agriculture are more numerous than ever before as U.S. farm markets are tied to developments in the farm and food sector, events in the general economy, and supply, demand, and policy changes in nations abroad.

Take this year's season average price for corn. One approach would be to isolate and quantify virtually every important factor—domestic and foreign—that affects the supply and demand for corn and to specify how these factors are related to one another, according to Bob House of the Economic Research Service.

But with the help of computer technology, economic theory, and some sophisticated statistical methods, economists have developed systematic approaches to forecasting, analyzing, evaluating, and simulating specific circumstances.

Computer Models: The Basics

There is a basic philosophy behind economic models which goes something like this: Any event—whether it's a price change, demand shift, or whatever—is the result of a finite number of other factors, which might be called variables. The number of variables may be very, very large, and the importance of the variables may be in a constant flux.

If all those variables and their relationships can be identified and given their proper weights in mathematical equations, then it is theoretically possible to develop a completely accurate forecasting model.

Of course, the difference between what's theoretically possible and what may be possible in the real world is the difference between night and day, House says.

Those who rely on computer models are aware of the differences, yet they insist that computer modeling is an important tool with unique advantages.

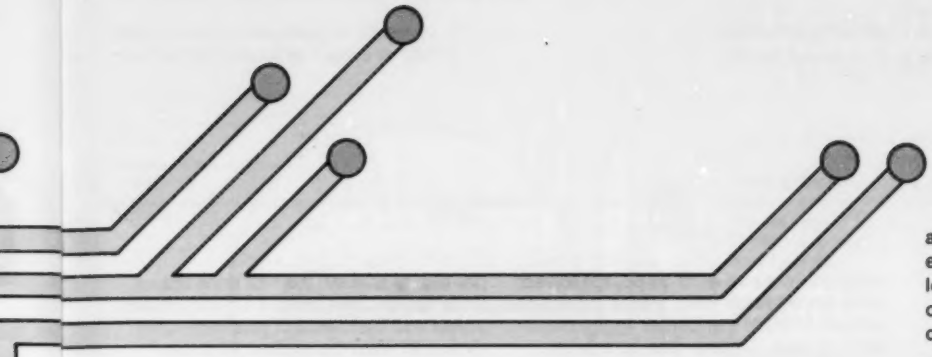
The advantages stem both from the concept of modeling—which predated computers—and from the addition of computer technology to the modeling process.

Modeling, for example, forces an analyst to identify the relevant variables, to study their past and present relationships, and to specify the cause-and-effect relationships using precise mathematical equations. If a modeler alters one or more of the variables, an equation can project a new outcome assuming past relationships don't change significantly.

Computers add a new dimension to modeling. For one thing, a computer can deal with an immense number of variables—far, far more than a human being. A computer is much faster, and can quickly project many possible outcomes given different assumptions. The pairing of modeling and computers can sometimes identify previously unknown relationships, and can alert analysts to the relative importance of changes among different variables.

The application of computer modeling in the physical and natural sciences can take considerable credit for current space technology and new developments in genetic engineering. The application of computer modeling to social sciences, such as economics, cannot yet point to the same spectacular results, but the potential is there, according to many of those who work in these fields.

This is not to say that computer modeling has no drawbacks or limitations. It



certainly does. The model is only as good as the knowledge, skills, and assumptions of the person who developed it, according to USDA economist Jim Tannehill, whose work involves mathematical programming for the Economic Research Service.

Types of Models

Some common uses of economic models are forecasting, optimization, and simulation. Many models can do a combination of these functions, Tannehill adds.

A forecasting model predicts a future outcome based on assumptions about influential factors and their relationships which are specified in the model. A forecasting model would be used to project this year's season average price for corn.

An optimization model is designed to tell you the best way of achieving some objective. If you wanted to maximize your farm income or develop the best feed ratio for your cattle given current prices, you'd use an optimization model.

A simulation model is designed to simulate the impacts of a change. An example: You want to know what will happen to farm income in 1986 if the loan rates for major crops are all reduced by 10 percent.

How a model is developed depends on the objectives the researcher hopes to achieve with the model's results, Tannehill says.

In doing the wide variety of research undertaken by USDA, economists use a variety of models. One model, designed by economists Mike Price of the Economic Research Service and Larry Salathe, currently with USDA's Economic Analysis Staff, is the Food and Agricultural Policy Simulator—

Whether models are used to look back or ahead, analysts see them as a way of focusing on relevant information.

FAPSIM—which can make annual projections of production and prices for U.S. livestock and major crops.

Used as a forecasting model, *FAPSIM* can estimate future prices and production. Used as a simulation model, it can simulate specific circumstances and solve questions pertaining to them. This works for the past as well as the future, so the model is useful in determining if a policy decision implemented, say, 5 years ago, actually saved money or achieved some other objective.

Price, Salathe, and colleague Dave Banker recently used the model to evaluate the cost effectiveness of the Farmer-Owned Reserve program.

Between 1977 and 1982, government outlays increased by nearly $6.2 billion as a result of the Farmer-Owned Reserve. What would costs have been if the Farmer-Owned Reserve had never been created and previous farm programs had been continued?

In theory, the economists found there would have been little difference in overall government outlays, provided that the crops under loan in the Farmer-Owned Reserve had been redeemed. But most of the crops ended up in government storage when loans reached maturity. Market prices were such that many farmers chose to forfeit the crops instead of repaying their loans.

According to *FAPSIM's* simulation, it is unlikely that prices will reach levels that allow the government to sell the grain, even within the next few years. So, in the long run, the Farmer-Owned Reserve could cost considerably more than a continuation of previous programs.

Why Not Just Guess?

What evidence do we have that models perform better as predictors than common reasoning or even guessing?

Good question, Price says, admitting that economic forecasting has recently gotten a lot of bad press, possibly because forecasters failed to predict the economic recovery. But, Price contends, the combination of modeling and reasoning is the only way to forecast.

Many economists who have worked in one area for a long time have actually developed models in their minds, Price says. The principles are the same. In answering a question, the computer model sorts through its data base. The researcher sorts through his or her knowledge.

The one commonality is knowledge: the knowledge of an individual versus the knowledge an individual has programmed into a computer. "In modeling, interpretation is really important," Price adds. Researchers must know the model's limitations as well as their own.

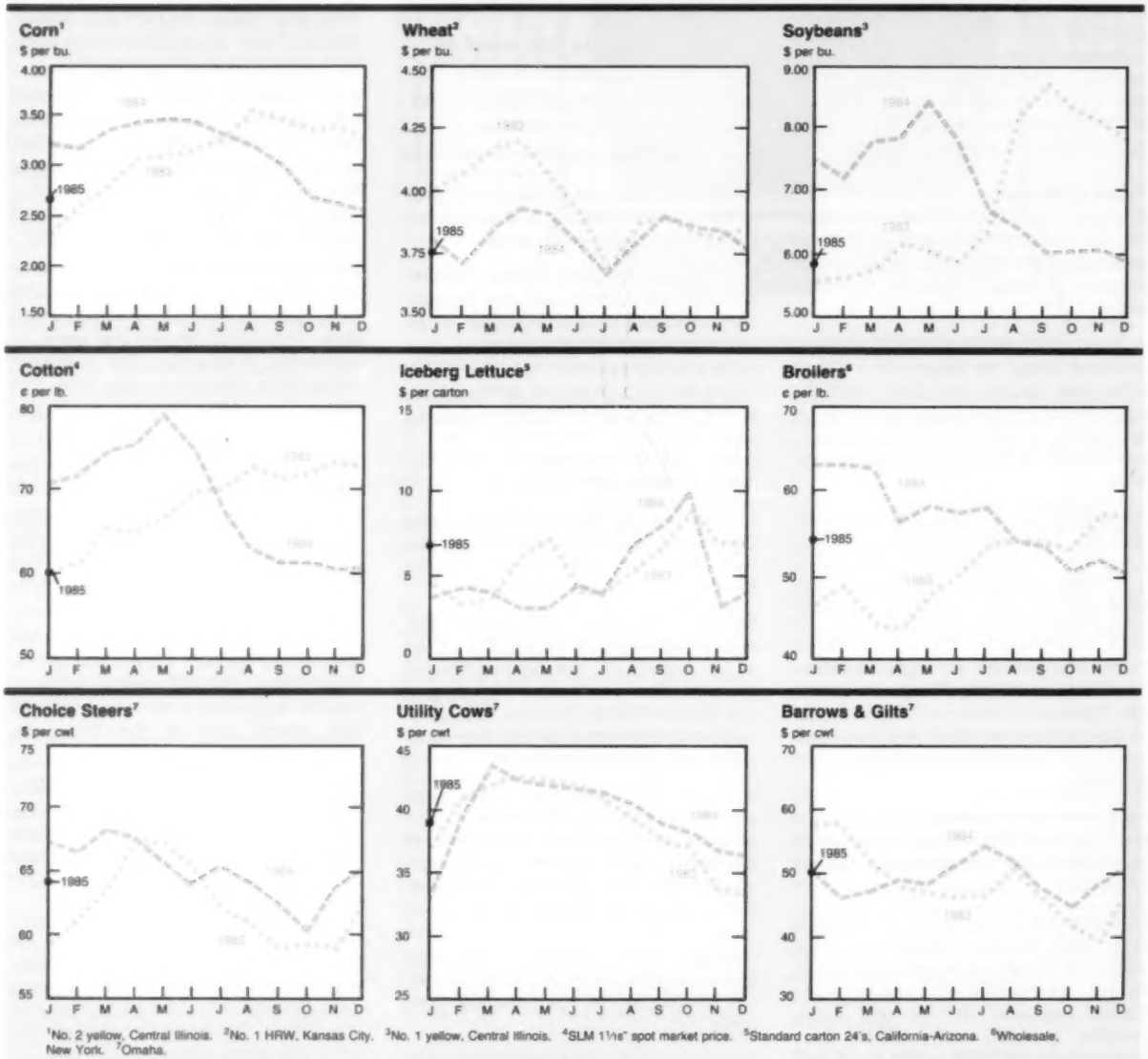
If several different models or methods are used to evaluate a given policy, it is likely there will be several different results, according to economist Shwu-Eng Webb, also of the Economic Research Service.

"Results can only be interpreted and used correctly if the researcher has some knowledge of the model and understands its assumptions, structural forms, characteristics, and objectives," Webb says. □

[Based on information provided by economists Jim Tannehill, Mike Price, and Bob House of the National Economics Division, and Shwu-Eng Webb of the Natural Resource Economics Division, Economic Research Service.]

Monthly Price Monitor

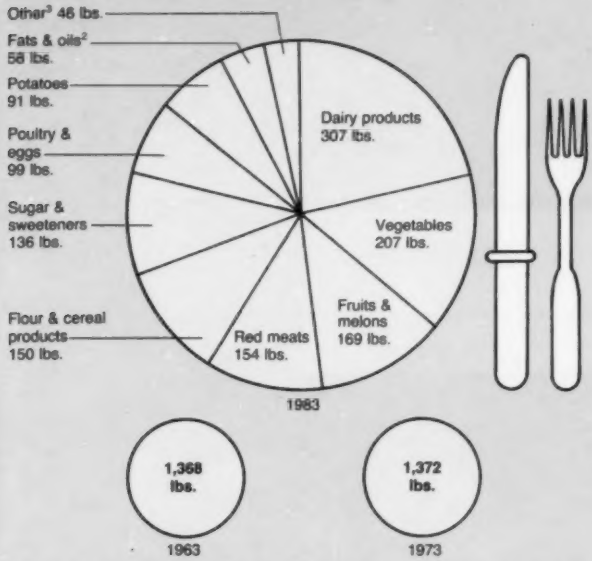
USDA's January 1985 index of farm prices was down 0.7% from December and 7.6% below a year ago. Corn prices rose to $2.64, wheat remained even with December's $3.76, and soybeans dropped 2¢ a bushel to $5.86, the lowest price since March 1983. Prices for lettuce jumped to $6.81 per carton. In the meat animals area, broilers rose 4¢ a pound since December. Utility cows rose $2.50 per cwt. to $38.99, the first price upturn since March 1984. Prices for both choice steers and barrows and gilts were down almost $1 from December. All prices shown are monthly averages.



[1]No. 2 yellow, Central Illinois. [2]No. 1 HRW, Kansas City. [3]No. 1 yellow, Central Illinois. [4]SLM 1 1/16" spot market price. [5]Standard carton 24's, California-Arizona. [6]Wholesale, New York. [7]Omaha.

A Look at America's Menu

Americans Consumed an Average of 1,417 Pounds of Food Per Capita in 1983[1]



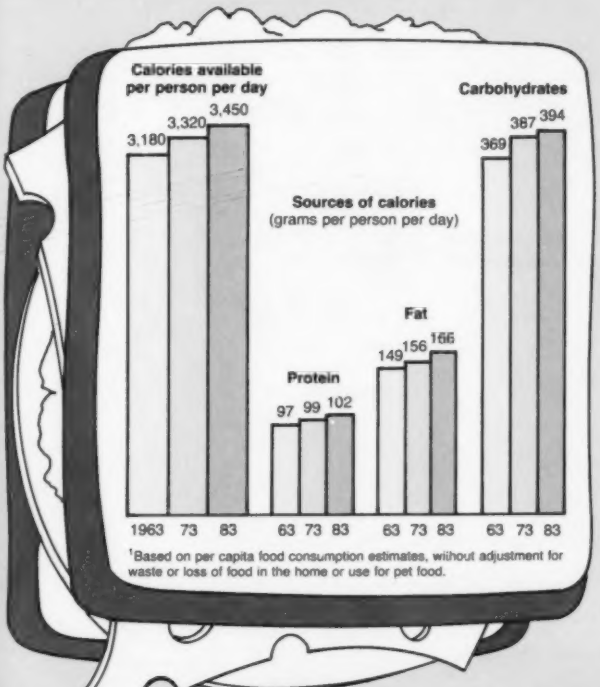
[1]Figures are in retail weight equivalents and include game meat, game fish, and home-grown fruits and vegetables. [2]Excludes butter and "invisible" fats consumed in meat, milk, and other products. [3]Includes fish, beans, peas, nuts, soya products, coffee, tea, and cocoa.

Consumption Figures for Different Foods Show Some Gainers . . . And Some Losers

	1963	1973	1983	Change, 1963-83
	pounds per capita			percent
Some gainers				
Beef	69.9	80.5	78.7	+12.6%
Low-fat milk[1]	6.4	44.0	77.8	+1,115.6%
Chicken & turkey	37.9	49.4	65.5	+72.8%
Beer (gallons)	15.3	20.1	24.3	+58.8%
Lettuce	19.3	21.4	24.1	+24.9%
Bananas	16.4	18.2	21.2	+29.3%
Shortening	13.6	17.1	18.6	+36.8%
Fish	10.7	12.8	12.9	+20.6%
American cheese	6.1	7.9	11.6	+90.2%
Rice	6.6	7.0	9.8	+48.5%
Apple juice	1.21	2.56	8.58	+609.1%
Whole tomatoes, canned	4.6	5.7	6.5	+41.3%
Potato chips	3.4	4.1	4.5	+32.4%
Frozen broccoli	0.6	1.1	1.5	+150.0%
Some losers				
Whole milk	251.7	191.4	132.9	−47.2%
Refined sugar	97.3	100.8	71.0	−27.0%
Fresh potatoes	76.1	49.1	51.9	−46.6%
Eggs (dozens)	25.7	23.4	21.1	−17.9%
Coffee	11.7	10.0	7.6	−35.0%
Canned & frozen peas	5.9	6.0	4.2	−28.8%
Fresh peaches	6.6	4.9	3.5	−47.0%
Lard	6.3	3.3	1.8	−71.4%

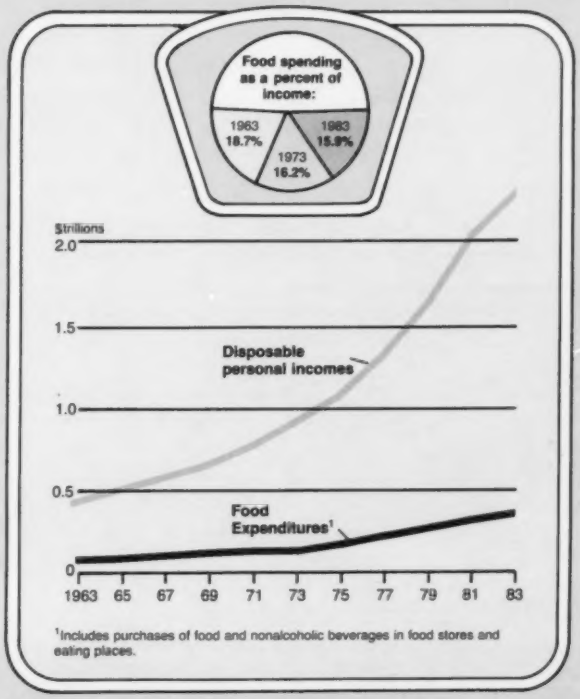
[1]Per capita sales.

The Calorie Count Is Up Since 1963, With Most of the Increase from Fats and Carbohydrates[1]



[1]Based on per capita food consumption estimates, wiihout adjustment for waste or loss of food in the home or use for pet food.

But the Calories Come Cheaper When Food Bills Are Measured Against Incomes



[1]Includes purchases of food and nonalcoholic beverages in food stores and eating places.

Data from the report, *Food Consumption, Prices, and Expenditures, 1963-83*, published by the Economic Research Service and compiled by economist Karen Bunch.

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